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X5 Dynamic Stability Control

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Model: E53 X5 3.0i, 4.4i and 4.6is

Production: All from Model Introduction

Objectives:

After completion of this module you will be able to:

- Understand X5 DSC operation
- Identify X5 DSC Components
- Understand HDC Operation

Purpose of System

DSC for the X5

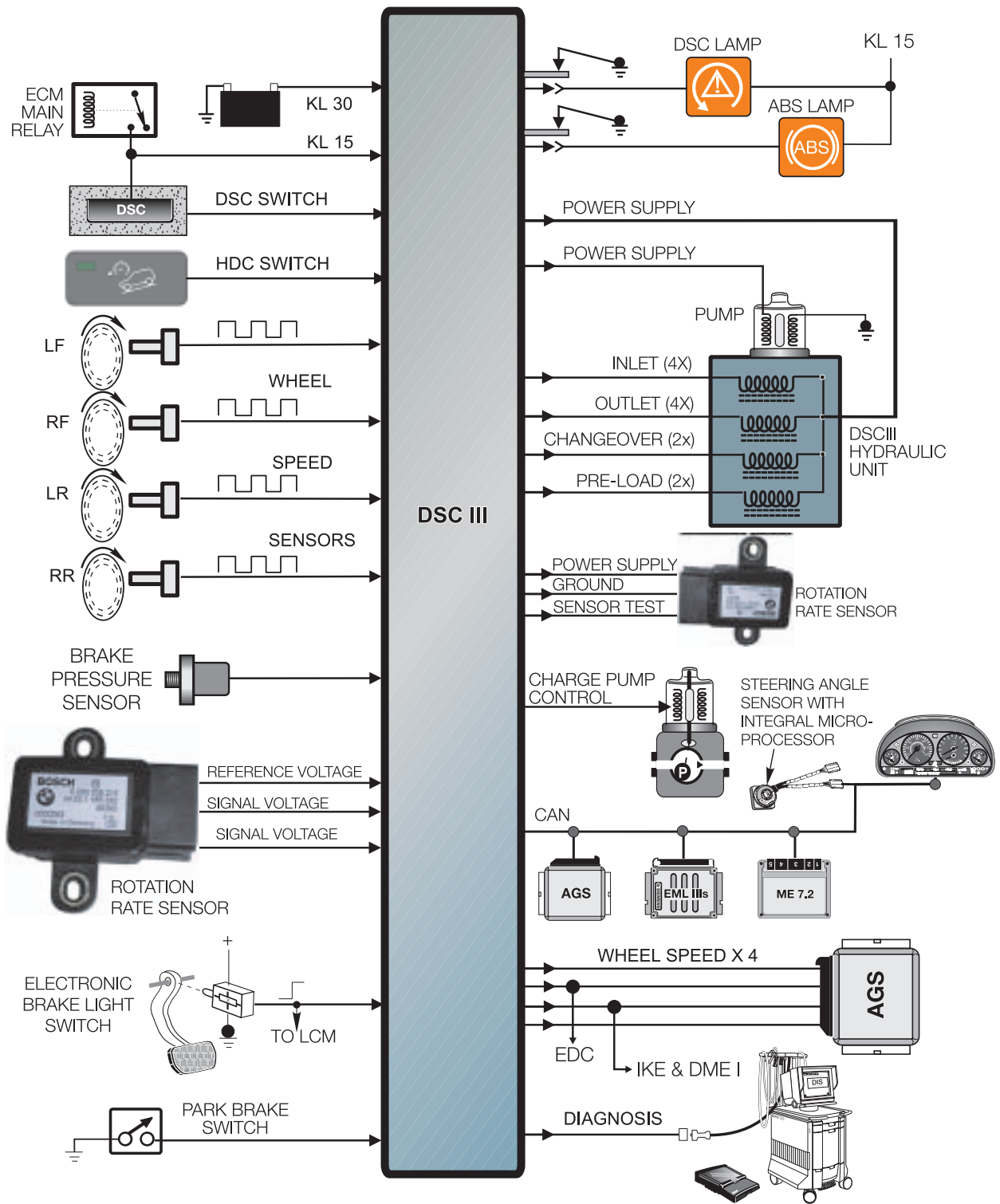
The X5 is equipped with DSC III for its stability control system. The components are the same as the DSC III system (version 5.7) currently installed in the E38/E39 vehicles. However the software and programming are changed to allow for new functions associated with all wheel drive and off-road use.

New/changed functions of the DSC III include:

- New Hill Decent Control (HDC) function
- New Differential Brake Control (ABD) function
- Changed traction control function
- Changed ABS function

The DSC system for the X5 provides all of the functions and features of the DSC III system currently in the E38/E39 vehicles. these functions/features include:

- Maintaining traction under all driving conditions
- Maintaining the directional Control (Longitudinal Stability)
- Providing Lateral Stability (Correction for oversteer/understeer)
- Providing Corner Braking Control (CBC)
- Providing Dynamic Braking System features of - Dynamic Braking Control and Maximum Braking Control (DBC and MBC)
- Providing Electronic Brake Proportioning (EBV)



Components

The components of the X5 DSC III system are similar to the E39 with Bosch DSC III 5.7. The location of some components is slightly different than the E39. The components are as follows:

- Integrated Control unit/Hydraulic unit with CAN Interface
- Charge pump
- Tandem Brake Master Cylinder
- Four wheel speed sensors (Active Hall Effect)
- Steering Angle Sensor
- Integrated Rotation Rate/Lateral Acceleration Sensor
- Brake Pressure Sensor
- Brake Fluid Level Switch
- Brake Light Switch
- Hand Brake Switch
- DSC Button
- DSC Warning Indicator
- CAN Interface (DME/AGS)
- HDC Switch (Hill Descent Control)

Components

Control Module/Hydraulic Unit

The control module is integrated into the hydraulic unit as one compact unit. This reduces the size and wiring required for DSC operation. Additionally the motor relay and valve relay have been replaced by solid state final stages in the control module. The hydraulic unit continues to use:

- Two pre-charge solenoid valves
- Two changeover solenoid valves
- Four intake solenoid valves
- Four outlet solenoid valves
- One return pump



Brake Pressure Sensor

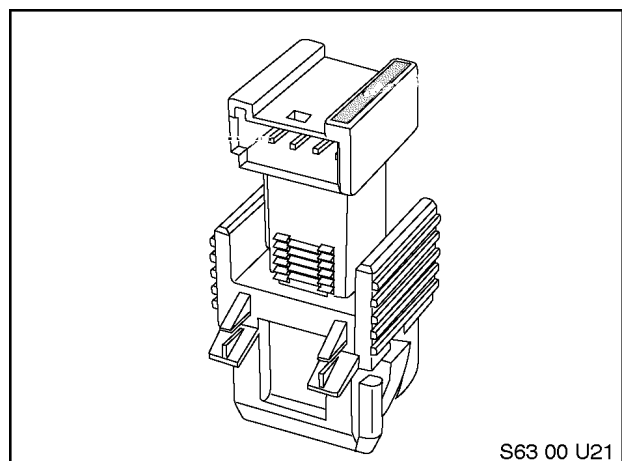
A brake pressure sensor is installed in the hydraulic unit to determine the degree of pressure build-up for Dynamic Brake Control. It is installed in the front axle brake circuit.

The sensor receives its power supply from the DSC control module and produces a linear voltage input signal ranging from 0.5 to 4.5 volts depending on how hard the brakes are applied.



Brake Light Switch (BLS)

The brake switch is an input to the DSC Module to inform it that the brakes are being applied. If the signal is received during an ASC regulation then brake regulation is interrupted.



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Pre-Charge Pump (Bosch 5.7)

The pre-charge pump is located below the master cylinder in the left side of the engine compartment.

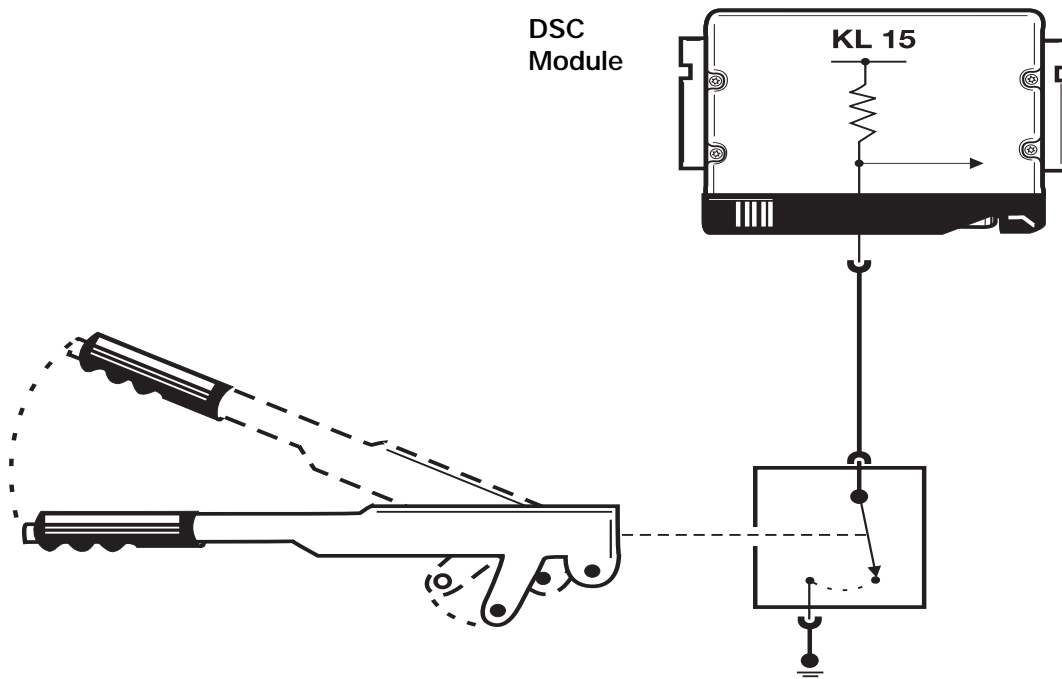
During ASC or DSC regulation with brake intervention, the DSC control unit activates the pre-charge pump. The pump delivers brake fluid at a pressure of 10 to 15 Bar to the front axle circuit of the master cylinder. The pressurized fluid also acts on the rear brake circuit of the master cylinder as well.

The Pre-charge pump ensures that an adequate amount of brake fluid is available at the hydraulic unit during brake regulation.



Handbrake Switch

The Hand Brake Switch is a ground input to the DSC module. This DSC module will discontinue MSR regulation when the signal is present.

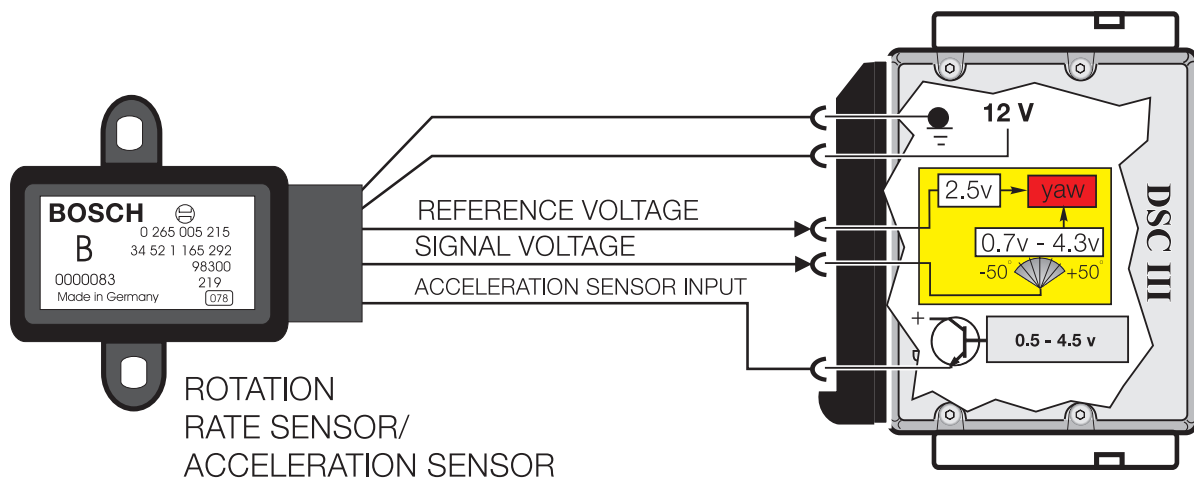


Rotation Rate/Transverse Acceleration Sensor

Located under the center console behind the MRS III control module, the rotation rate and transverse acceleration sensor provides two inputs to the DSC control module. The sensor is isolated from body/chassis vibrations through its rubber mounting.

For rotational speed, the sensor produces a reference signal of 2.5 volts and a linear voltage signal from 0.7 to 4.3 volts. This linear voltage input signal is used by the DSC control module as the degree of rotational rate (yaw).

The sensor also produces a linear voltage signal for the lateral acceleration (G-force) that ranges from 0.5 to 4.5 volts. The DSC control module uses this input to determine the side forces acting on the vehicle for DSC regulation.



DSC Switch

The system is active whenever the ignition is switched on. When pressed, the switch provides a momentary 12 volt signal to the DSC III control module to switch the system off (DSC indicator in cluster illuminated.) When pressed again, the system switches back on (DSC Indicator in cluster goes off.)



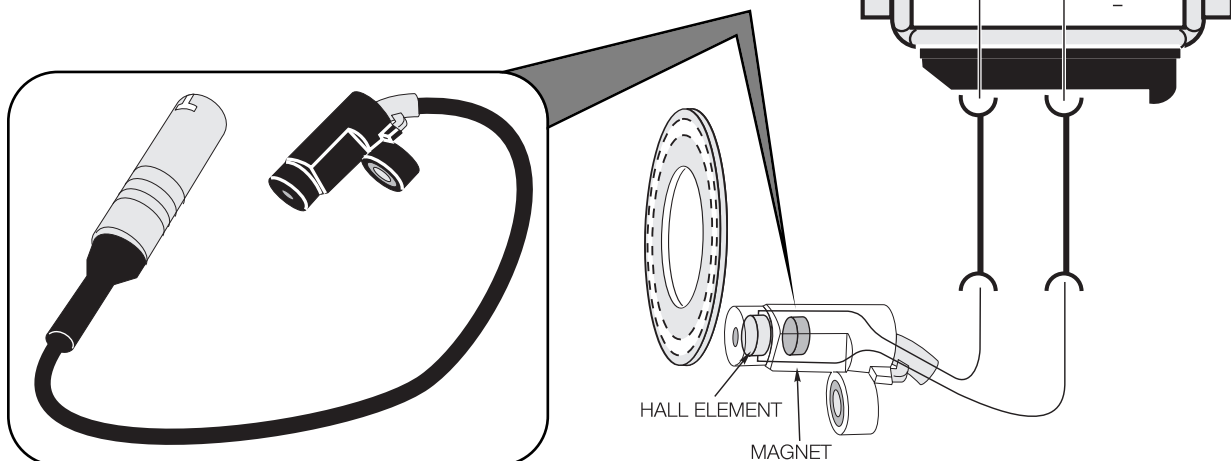
HDC Switch

The hill decent control function is activated by pressing the HDC switch located in the center console. The LED will come on steady when the function is in standby and flash when HDC is regulating



Wheel Speed Sensors

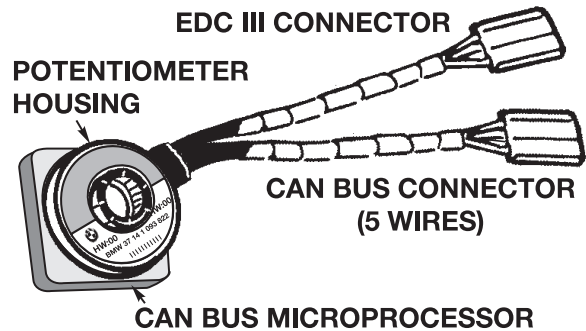
- 2 wire Hall Effect Sensor - "Square wave generator".
- Stabilized 8 volt power supply to hall element on one wire, ground path for sensor through second wire back to control module. Signal is generated by the pulse wheel affecting voltage flow through hall element creating a low of .75 and a high of 2.5 volts.
- 48 pulse incremental wheel incorporated in wheel bearing cover for contaminant protection. 48 pulses = one complete wheel revolution.
- Sensors identical to DSC II and ASC V systems.
- Sensors provide immediate vehicle speed recognition.



Steering Angle Sensor (LEW)

The Steering angle sensor is mounted at the bottom of the steering spindle (in front of the flex coupling).

The sensor is equipped with a processor and is directly linked to the CAN bus to communicate with the DSC III module.



The sensor still utilizes two potentiometers to determine the steering angle and the rate of steering. These are the raw signals the CAN Bus microprocessor utilizes to create the steering angle signal for broadcast on the CAN bus.

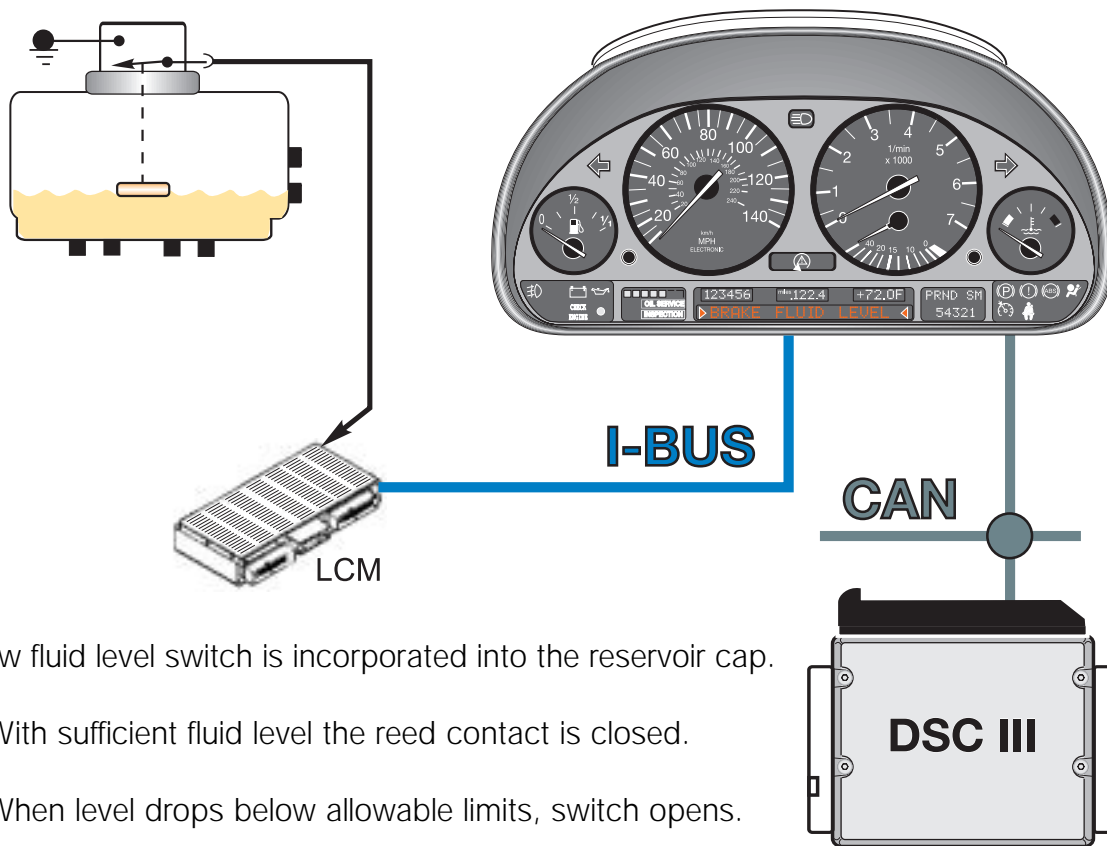
The sensor requires calibration after repairs to the steering or suspension system (found in DIS Service Functions). Once the calibration is completed the sensor now also sends an identification number over the CAN bus to the DSC III module. The ID provides confirmation in the DSC module that the steering angle sensor is properly calibrated.

If the ID differs due to component swapping it will not be possible to enter the DSC system for diagnosis. The DIS will request that the steering angle sensor be recalibrated using the service functions. Once complete a new ID number is generated and the DSC III control module and Steering angle sensor are properly mated.

The DSC III logic checks the plausibility of the steering angle sensor against the other DSC III inputs (front wheel speeds, rotation and lateral acceleration sensors). If battery voltage is interrupted, the current steering wheel rotation is recalculated by the DSC module evaluating the front wheel speeds.

Replacement steering angle sensors must be ZCS coded when installed in the vehicle prior to the calibration procedure.

Brake Fluid Level Warning Switch



A new fluid level switch is incorporated into the reservoir cap.

- With sufficient fluid level the reed contact is closed.
- When level drops below allowable limits, switch opens.

Since the normal position is closed, this circuit is monitored for shorts to + and ground.

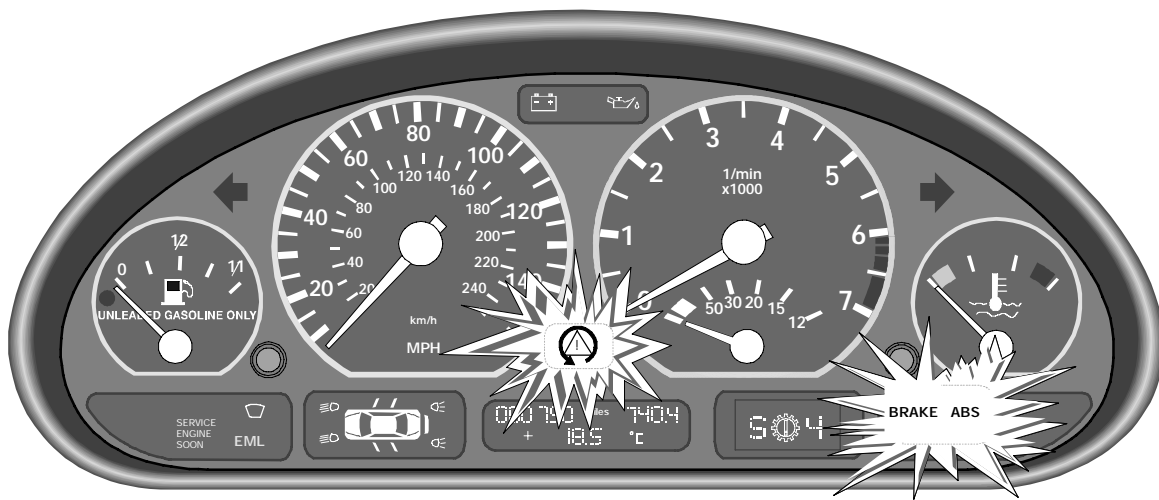
The LCM constantly monitors the input. If the ground signal is **momentary**, the LCM signals the Instrument cluster of the condition. The instrument cluster then informs the DSC III control module over the CAN bus. If the signal is received just prior to the activation of the charge pump, the charge pump activation is delayed.

If the signal is present for more than 25 seconds, the LCM issues two I BUS message for the Instrument Cluster:

1. Post "Brake Fluid Level" in the Matrix display
2. Notify the DSC III via CAN that the Fluid level has been low for more than 25 seconds.

The DSC III control module immediately switches DSC III functions off and continuously illuminates the DSC indicator in the cluster.

Instrument Cluster Warning Indicators



Three warning indicator lamps are arranged in the instrument cluster:

- DSC lamp: Indicates fault in DSC or system disabled by the switch.
- ABS lamp: Indicates a fault in the ABS system.
- ABL "BRAKE" lamp:

This lamp is a general brake warning and illuminates two different colors.

- Red indicates low brake fluid or hand brake engaged.
- Yellow indicates DSC/ABS fault or system disabled by the switch.

The DSC and yellow ABL lamp are controlled by the DSC III control unit via the CAN bus. The ABS lamp is controlled directly by the DSC III control unit via hardwire.

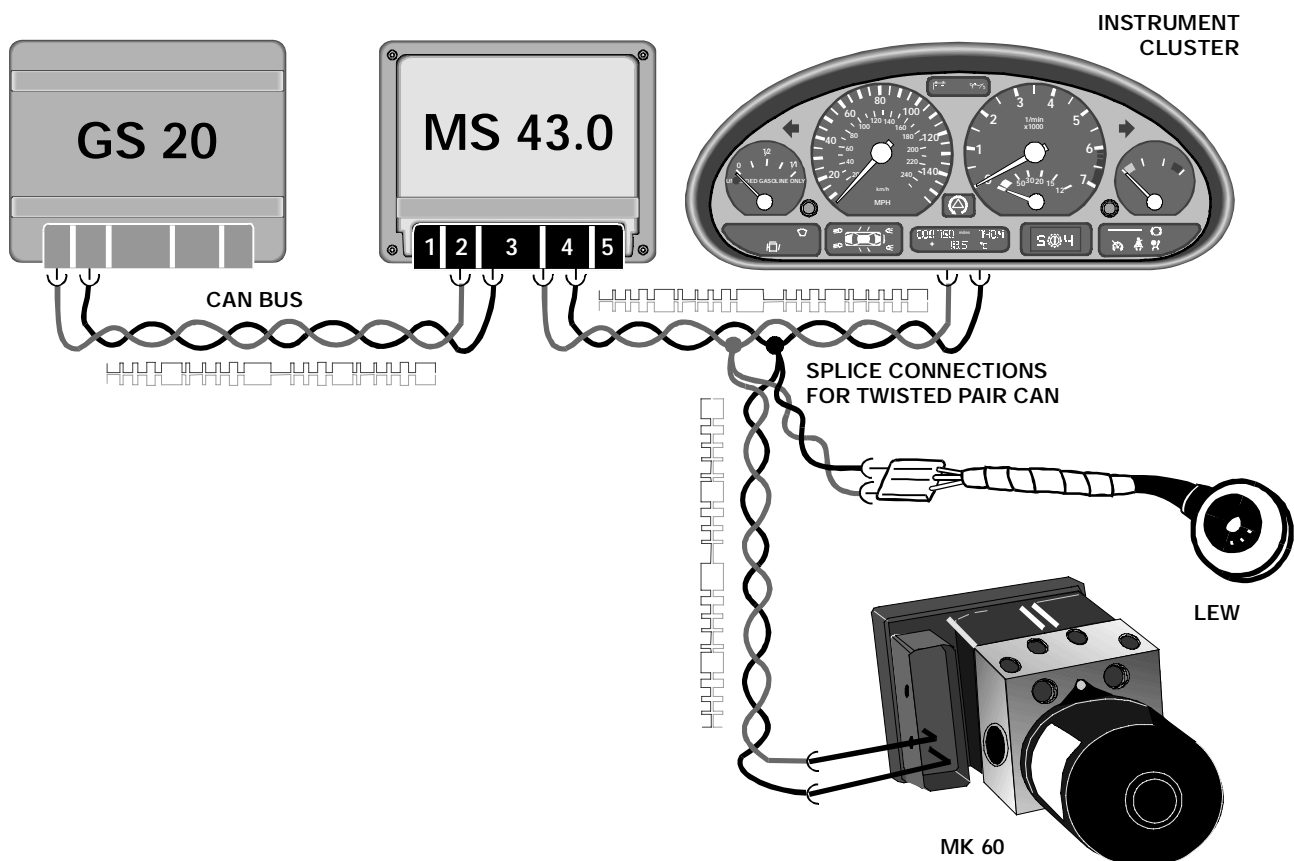
CAN Interface

The MK60 is connected to the CAN bus for communication with the AGS, DME control module, Steering Angle Sensor and the Instrument Cluster.

The CAN bus allows all of the connected control modules to send and receive information and commands.

Communication with the MK60 includes:

- **DME** - The DME sends current engine torque. MK60 commands the DME to reduce (ASC/DSC) or raise (MSR) engine torque.
- **AGS** - The MK60 commands the AGS to suppress shifts during regulation.
- **LEW** - The MK60 receives steering angle information.
- **KOMBI** - The MK60 commands the instrument cluster to activate or deactivate the warning lamps.
- All four wheels speed signals are sent over the CAN bus for use by other modules.



Principle of Operation

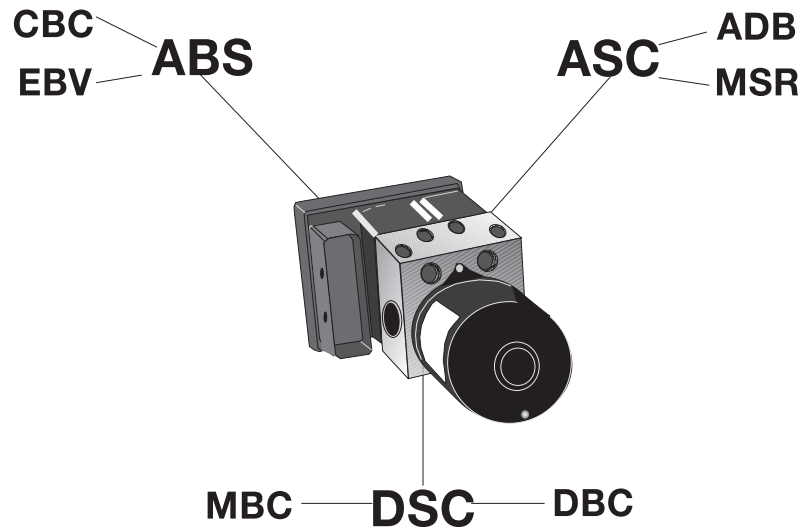
The scope of control for the DSC III is comprised of three systems:

- ABS
- ASC+T
- DSC

Based on signals coming from the various sensors the DSC III will determine which system is best suited to maintain control of the vehicle.

In addition to the three basic systems, there are several sub-functions which are activated during very specific circumstances. The sub-functions are:

- CBC
- EBV
- MSR
- ADB
- DBC
- MBC



The ABS system can prevent wheel lock when braking by comparing the four active wheel speed sensors to the average vehicle speed. If a wheel is locking during braking or has dropped below a speed threshold programmed in the control unit ABS, braking will begin. ABS braking is possible when vehicle speeds are above 12 km/h (7mph).

The function of ABS for All-Wheel Drive use has an additional variation. During braking on loose surfaces the **wedge** effect is helpful. Gravel or dirt will build up in front of the tire when the wheel is locked, creating an increased braking effect. The system allows the locking of one or both front wheels up to approx. 20km/h (12mph). This "poor road surface logic" does not affect steerability. As soon as the control unit detects steering wheel change, the ABS system regulates normally again.

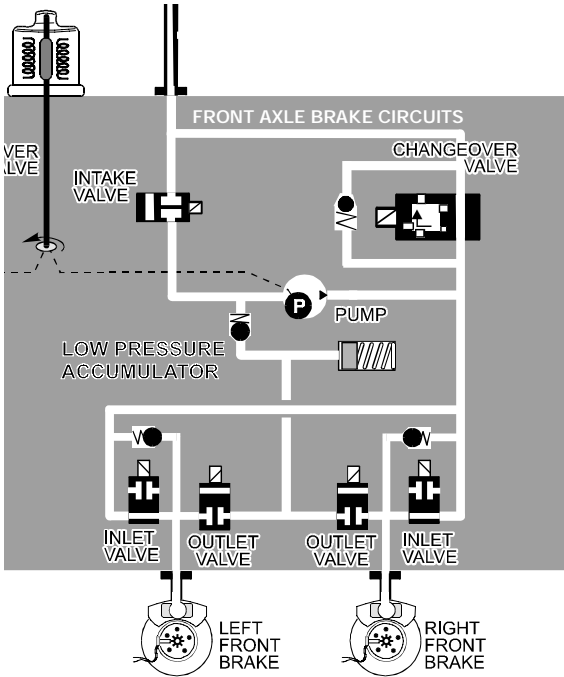
ABS regulation has three phases:

- Pressure Build
- Pressure Hold
- Pressure Release

Pressure Build already occurs during normal braking, so when ABS first intervenes it will start holding pressure by energizing the Inlet Valve. For example, if the right rear wheel is locking up, both Inlet Valves will be energized, regulating both wheels together. This logic is known as Select Low. Front wheels can be regulated individually as needed to prevent lockup.

Energizing the Inlet Valve closes the brake fluid passage to the calipers and traps the fluid at the current pressure, thus not allowing the brake pressure to rise any further.

If the wheel speed does not increase, the Pressure Release phase begins. Pressure Release occurs when the control unit energizes the Outlet Valve while continuing



to hold the Inlet Valve closed. The trapped brake fluid is released out of the calipers reducing braking pressure.

At the same time the pump is switched on which draws in the released brake fluid and pumps it back into the pressure build-up circuit restoring the volume of brake fluid again in front of the Inlet valve.

Depending on conditions the ABS system may cycle between these three phases from 3 to 12 times a second to prevent wheel lock.

ABS Sub-functions

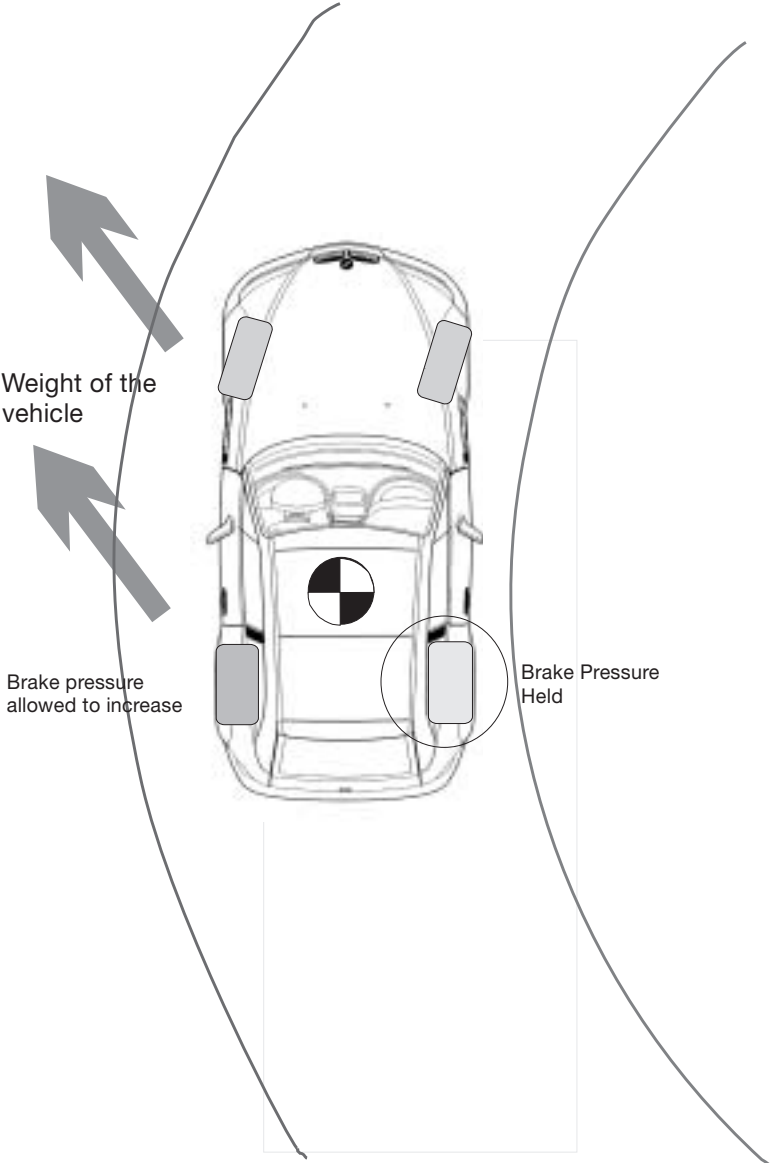
Corner Brake Control (CBC)

CBC can occur if the vehicle is cornering and ABS regulation is not taking place.

If the control unit detects transverse acceleration in excess of 0.6g and the brakes are applied, CBC prevents a build up in brake pressure to the inside rear wheel. This prevents the vehicle from entering into an unstable situation that can lead to **Oversteer**.

The DSC III accomplishes this by closing the Inlet Valve, thus not allowing brake pressure to increase at the brake caliper.

The difference in braking force between the two rear wheels creates a yaw force that opposes the oversteer and allows the vehicle to handle **neutrally**.



Electronic Brake Force Distribution (EBV)

EBV will adjust brake pressure to the rear axle based on the rate of slow-down of the rear wheels, ensuring even brake force between the front and rear of the vehicle.

The control unit monitors the wheel speed when the brakes are applied and compares the deceleration rate of the front and rear axle to determine required regulation.

If the vehicle is moderately to fully loaded, the rear axle will take longer to slow down, rear wheel brakes then can be applied at a higher pressure.

If the vehicle is lightly loaded, a similar brake pressure would be too great and result in an unstable situation.

If EBV control intervention is required, the control unit cycles the intake valve on the rear brake calipers to prevent further build-up.

Benefits of EBV are

- Enhanced braking due to an even distribution of brake force.
- Rear wheel brake size can be increased.
- Front and rear brakes wear at a similar rate.

Automatic Stability Control (ASC+T)

ASC prevents unintentional wheel slip of the drive wheels in every situation.

The DSC III control unit determines if the vehicle is losing traction due to excessive longitudinal wheel slip based on input from the wheel speed sensors. An ASC regulating sequence is initiated if the wheel slip exceeds the control units stored allowable values.

The DSC III can control longitudinal wheel slip by two means:

- Automatic Stability Control **ASC. Engine Intervention**
- Automatic Differential Brake **ADB. Brake intervention**

ASC Engine Intervention

Engine torque may be reduced by:

- Reducing the throttle opening angle
- Retarding the ignition
- Canceling individual cylinders by fuel injection cutout.

The DSC III control unit determines the amount of torque reduction that is necessary and sends the request for regulation to the DME via the CAN bus.

ADB Brake Intervention

The ADB is an automatic differential lock that improves traction. The slipping wheel is braked by pressure built up in the hydraulic unit. The drive torque can be transferred to the wheel with the greater traction, which can transmit drive power to the road. This function acts much like a limited slip differential.

Brake intervention is applied to the individual wheel which is losing traction by regulating the brake calipers in three phases:

- Pressure Build
- Pressure Hold
- Pressure Release

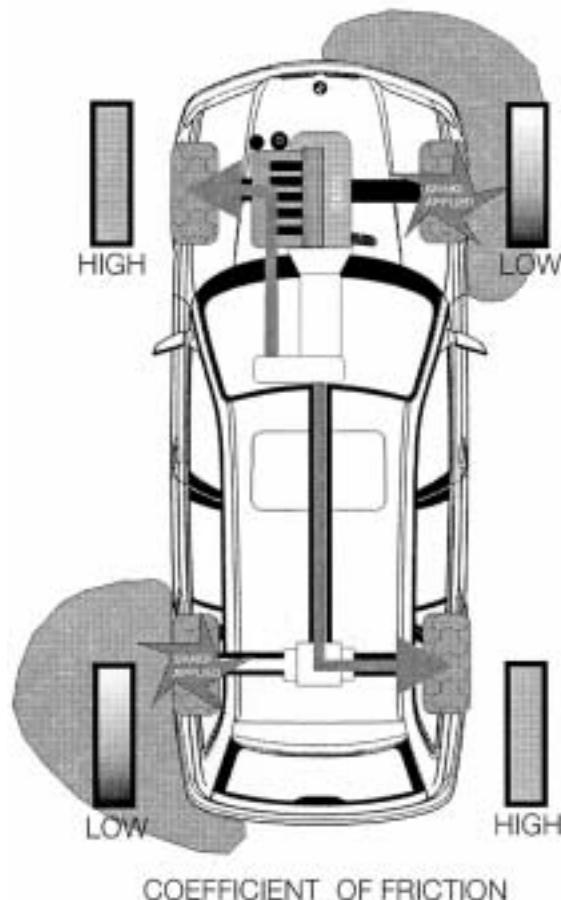
When brake intervention is necessary, the axle not being regulated must be isolated from the Pressure Build sequence in the hydraulic unit. This is accomplished by closing both Inlet Solenoid Valves for that axle.

Here is an example of an ADB brake intervention at the left rear wheel:

- The Changeover Valve for the rear brake circuit, the right rear and both front Inlet Valves are energized and closed.
- The rear brake circuit Intake Valve is energized and opened.
- The Return/Pressure pump is activated and draws brake fluid through the open Intake Valve from the Master Cylinder (**via the Central Valve**) and delivers the pressurized fluid to the open Inlet Valve braking the left rear wheel.
- Pressure Hold and Pressure Release are done by cycling the Inlet and Outlet Valves similar to the ABS sequence described previously.

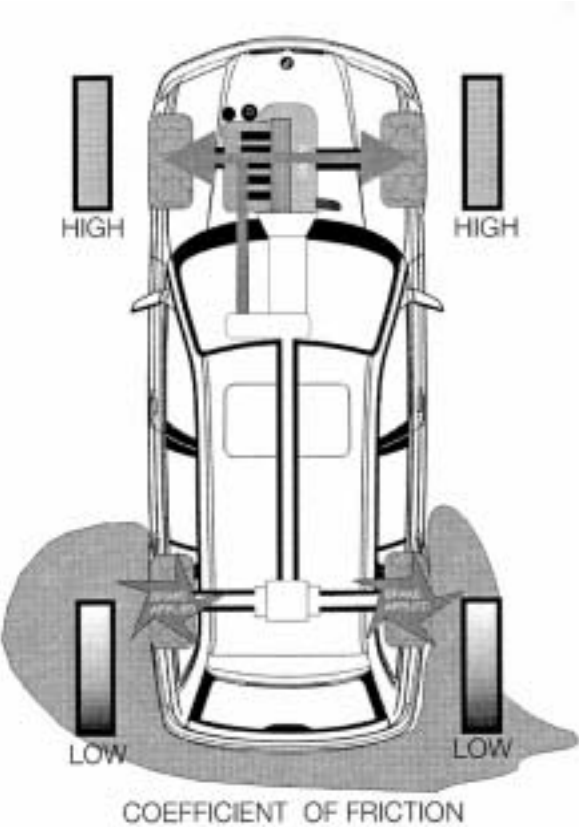
The drive torque can be distributed to the wheels with high friction coefficients (traction).

Transversal differential-lock function.



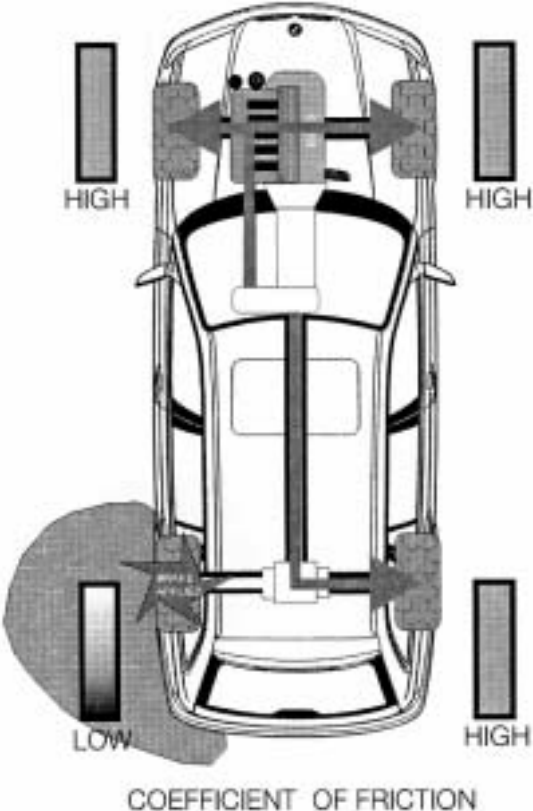
Longitudinal differential-lock function

By performing brake intervention at the axle with a low friction coefficient, drive torque can be transmitted to the front wheels.



Longitudinal and transversal differential-lock function

By performing brake intervention at the diagonally opposing wheels with a low friction coefficient, drive torque can be transmitted to the two wheels with more traction.



ASC Sub-function

Engine Drag Torque Reduction (MSR)

If the vehicle is driven in low gear when coasting down hill, or if there is a sudden shift to a lower gear, the wheels may be slowed down by the engine braking effect to rapidly. This could result in an unstable situation.

If the front wheels are turning faster than the rear wheels the DSC III control unit signals the DME via the CAN bus to **raise** the engine torque. DME cancels fuel cut-off and allows the engine speed to increase, this allows the drive wheels to accelerate to match the speed of the non-driven wheels.

MSR regulation is cancelled if the brake pedal or hand brake is applied.

Dynamic Stability Control (DSC)

With the introduction of DSC systems, lateral dynamics were taken into account for the first time. The DSC III system will initiate a DSC regulation sequence if the control unit detects a difference between the drivers desired turning angle and the actual rotation angle of the vehicle. The control unit determines vehicle stability based on:

- Steering wheel angle
- Wheel speed
- Transverse acceleration forces
- Rotation angle and speed (yaw)

Once the control unit determines that the vehicle is in an unstable situation, it also identifies whether it is oversteering or understeering. This distinction is important because it determines which control strategy should be used to help stabilize the vehicle.

DSC regulation consist of :

- Engine intervention
- Engine and brake intervention (**any wheel**)
- Brake intervention

Understeer

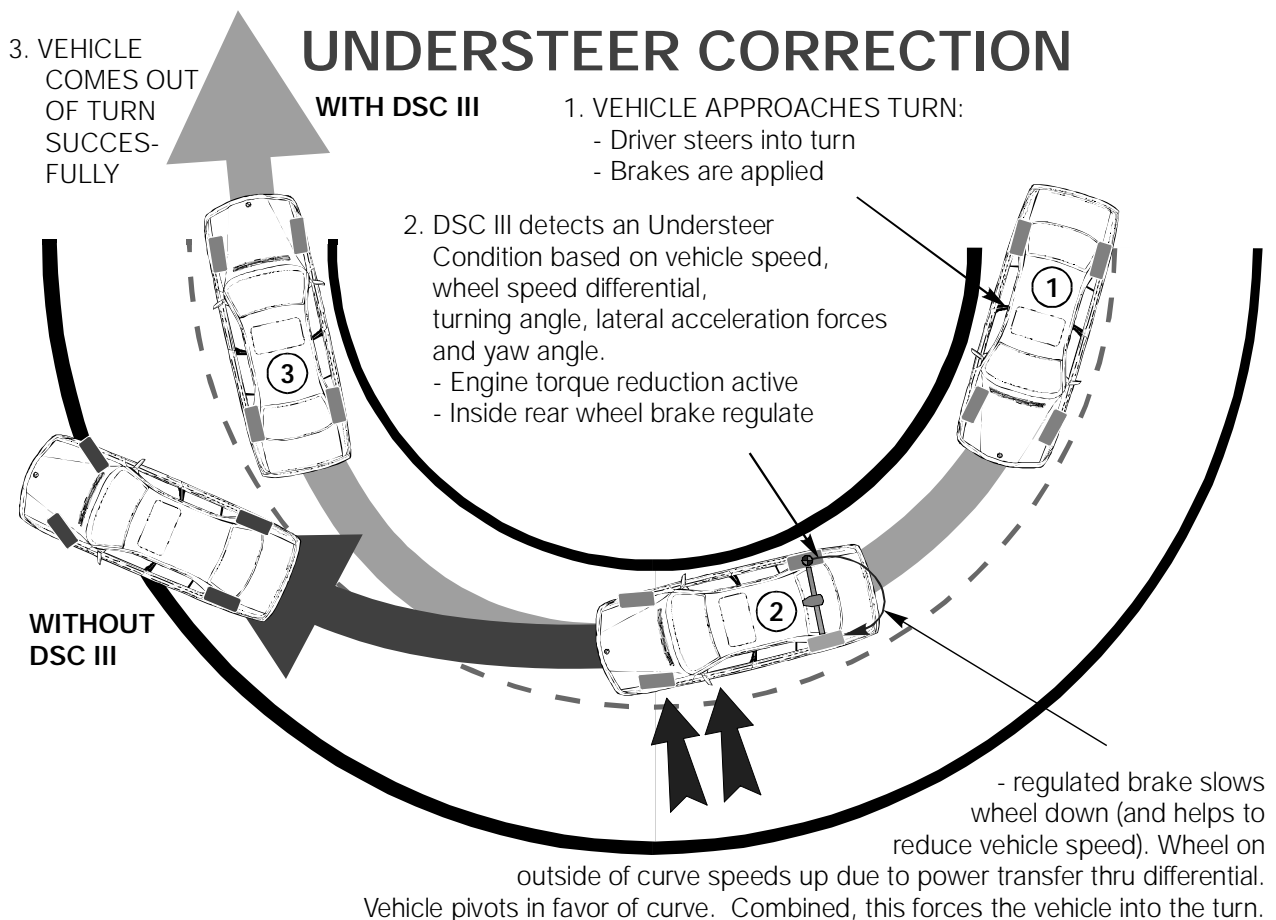
Understeer occurs when the driver wishes to turn a corner, but despite the front wheels being turned in the direction of the curve, the vehicle continues its forward track. This occurs when the front wheels no longer have sufficient lateral locating force (traction).

The DSC III can identify the situation and initiate a corrective action based on engine torque reduction followed by a controlled brake intervention sequence if needed.

Engine torque reduction is carried out by the DME from a request by the DSC via the CAN bus. The DME sends the torque reduction confirmation back to the DSC.

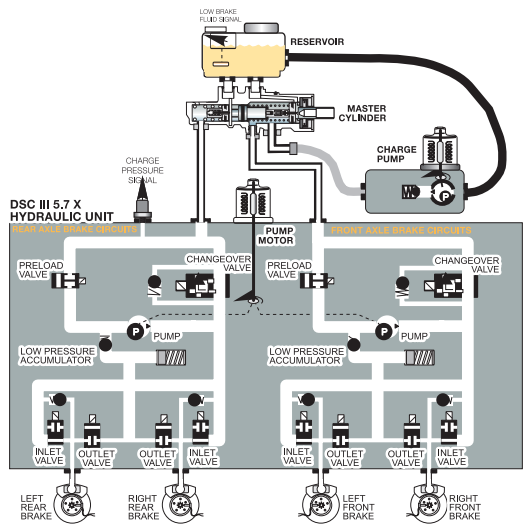
Brake intervention is carried out by the DSC III hydraulic unit if the driver is not actively braking. An example of a brake intervention at the inside rear wheel is as follows:

- All Inlet Valves are closed except for the right rear inlet.
- Intake Valve for rear circuit is opened.
- Both Changeover Valves are closed.
- Return pump operated.



Just as an ASC regulation, DSC brake intervention carries out:

- Pressure Build
- Pressure Hold
- Pressure release

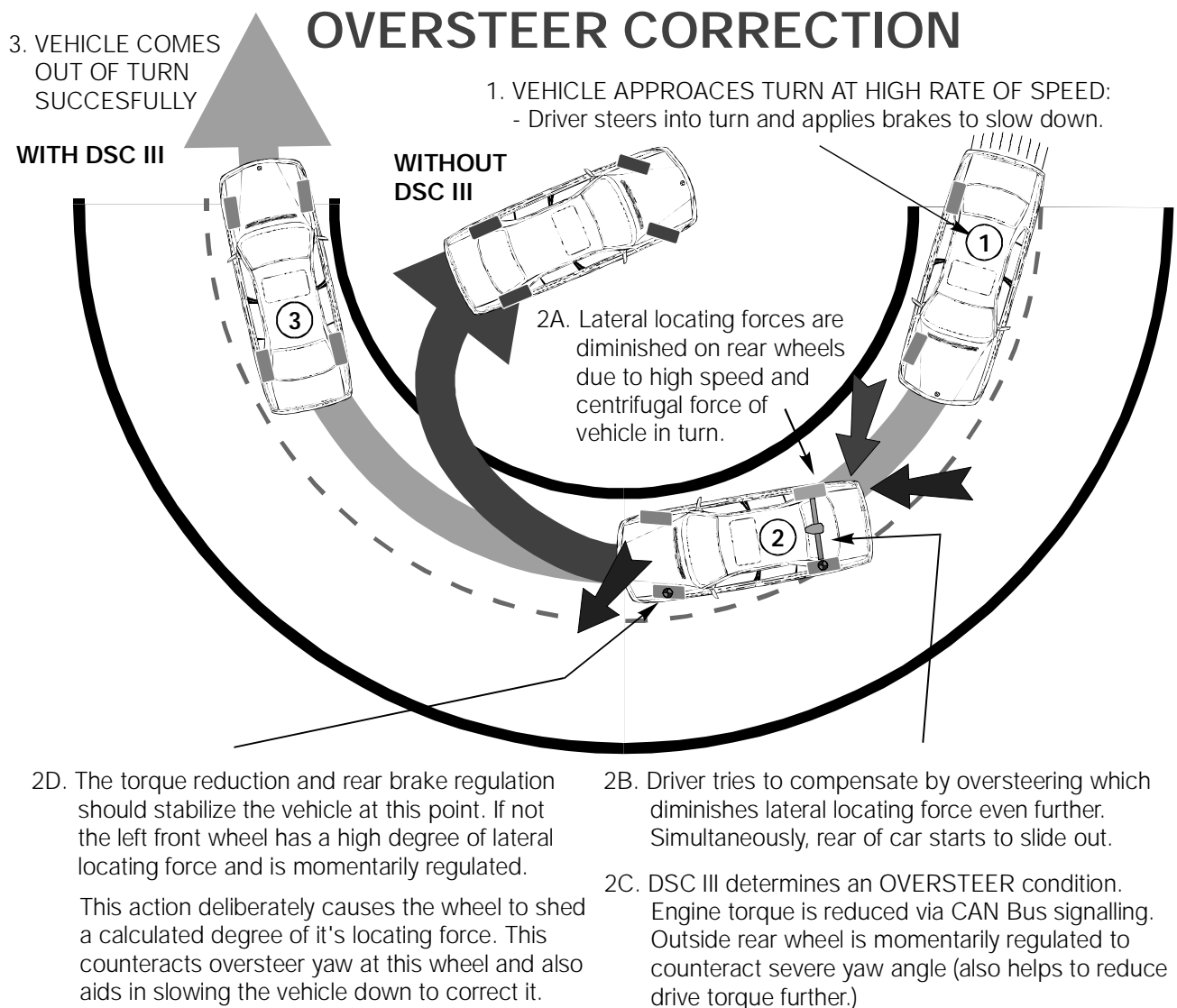


Oversteer

Oversteer occurs when the driver wishes to turn a corner and the tail of the vehicle slides outward, leading the turn. This is caused by the rear tires losing traction and not being able to hold against the centrifugal force acting upon the vehicle.

The DSC III can identify the situation and initiate a corrective action based on engine torque reduction followed by a controlled brake intervention sequence if needed.

Engine torque reduction is carried out by the DME from a request by the DSC via the CAN bus. The DME sends the torque reduction confirmation back to the DSC.



DSC Sub-functions

Dynamic Brake System (DBS)

DBS is designed to assist the driver in emergency braking situations by automatically increasing pressure to the vehicles brake system. This allows the vehicle to stop in the shortest distance possible. DBS was first available in 1999 Bosch DSC III 5.7 systems.

The DBS system contains two functions: Dynamic Brake Control and Maximum Brake Control. DBS functions are programmed into the DSC III control unit and require no additional hardware over conventional DSC.

Dynamic Brake Control (DBC)

The DBC function is designed to provide an increase in braking pressure up to the ABS threshold during rapid (emergency) braking situations. The DSC III control unit monitors the inputs from the brake light switch and the brake pressure sensor. The triggering criteria for activation of DBC is, how rapidly is the brake pressure increasing with an application of the brake pedal. The triggering conditions are:

- Brake light switch on.
- Brake pressure in the master cylinder above threshold.
- Brake pressure build-up speed above threshold.
- Vehicle road speed above 3mph (5km/h).
- Pressure sensor self test completed and sensor not faulted.
- Vehicle traveling forward.
- Not all of the wheels in ABS regulation range.

If the threshold for DBC triggering is achieved, the DSC III control unit will activate a pressure build-up intervention by activating the pre-charge and return pump. The pressure at all wheels is increased up to the ABS regulation point. This ensures that the maximum brake force is applied to the vehicle.

During DBC the rear axle is controlled with Select-Low logic and the front wheels are regulated individually. DBC will continue until:

- The driver releases the brake pedal.
- Brake pressure falls below threshold.
- Vehicle road speed below 3mph.

DBC will also be switched off if a fault occurs in with any of the necessary input sensors. A fault in DBC will illuminate the "BRAKE" (ABL) lamp yellow to warn the driver, depending on the failure the DSC lamp may be illuminated as well.

Maximum Brake Control (MBC)

The MBC function is designed to support driver initiated braking by building up pressure in the rear brake circuit when the front wheels are already in ABS regulation.

The additional braking pressure is designed to bring the rear wheels up to the ABS regulation point shortening the stopping distance. The MBC function is triggered when the brakes are applied more slowly than the threshold needed for a DBC regulation. The triggering conditions are:

- Both front wheels in ABS regulation.
- Vehicle road speed above 3mph (5km/h).
- DBC and pressure sensor initialization test successful.
- Vehicle traveling forward.
- Rear wheels not in ABS regulation.

If the threshold for MBC triggering is achieved, the DSC III control unit will activate a pressure build-up intervention by activating the return pump. The pressure at the rear wheels is increased up to the ABS regulation point. This ensures that the maximum brake force is applied to the vehicle.

The MBC function will be switched off if:

- Front wheels drop out of ABS regulation.
- The driver releases the brake pedal.
- Brake pressure falls below threshold.
- Vehicle road speed below 3mph.

MBC will also be switched off if a fault occurs in with any of the necessary input sensors. A fault in MBC will illuminate the "BRAKE" (ABL) lamp yellow to warn the driver, depending on the failure the DSC lamp may be illuminated as well.

X5 DSC New Functions

Hill Descent Control

Hill Decent Control (HDC) is designed for off road use to automatically slow the vehicle and maintain a steady speed on steep gradients. This function allows the driver to focus on steering and controlling the vehicle without having to use the brakes to slow the vehicle.

HDC is activated manually through the push button switch located in the center switch panel located in the console. When activated, the vehicle's speed is held to approximately 5 MPH by the DSC system pulsing the brakes to maintain the speed.

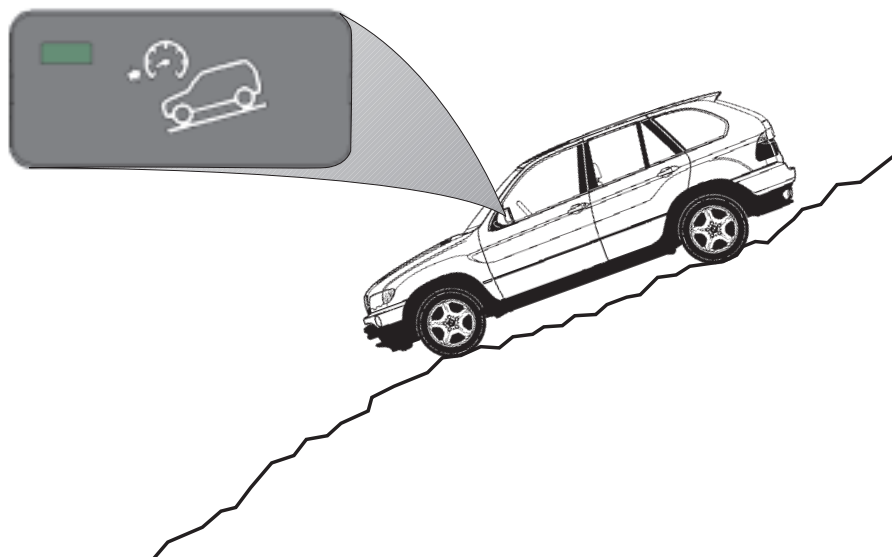
The following conditions must be met before the HDC will activate:

- Push button pressed - LED "ON"
- Vehicle speed: < 25 MPH
- Accelerator pedal pressed <15%
- Downhill driving recognized

Downhill is recognized from the vehicle's speed and engine load from the engine control module. The accelerator pedal and engine load signals are passed over the CAN bus to the DSC control module.

The HDC switch can be pressed at speeds < 37MPH and the LED will come on to indicate standby mode. However the system will not activate until the vehicle's speed is below 25.

The driver can accelerate with HDC active up to approximately 20% engine load. The HDC will stop regulating as long as the driver is requesting a speed increase. If the vehicle's speed is > 37 MPH, the HDC function is automatically switched OFF.



Automatic Differential Braking

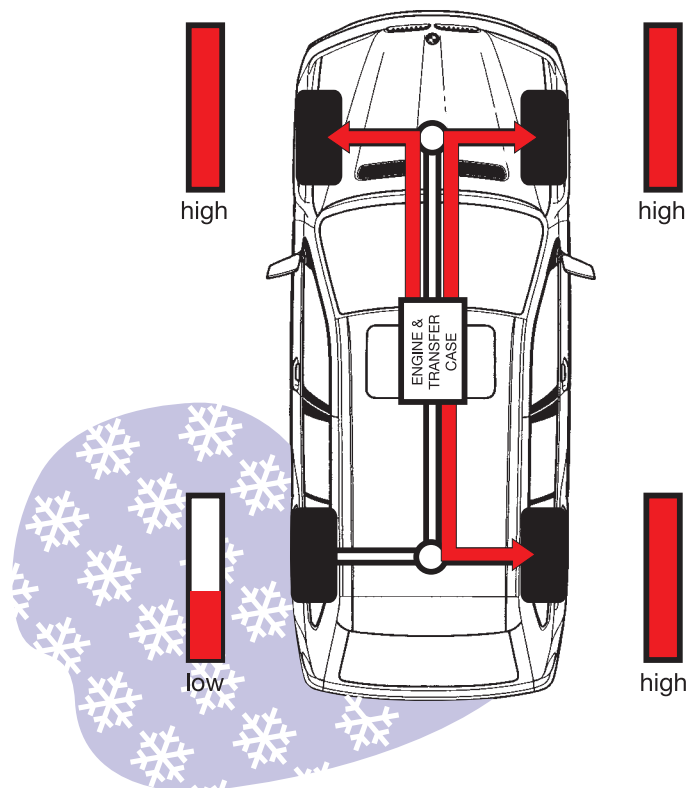
On dry pavement with no wheel slip, the vehicle's driving torque is split 68% rear and 32% front through the planetary gear differential transfer case.

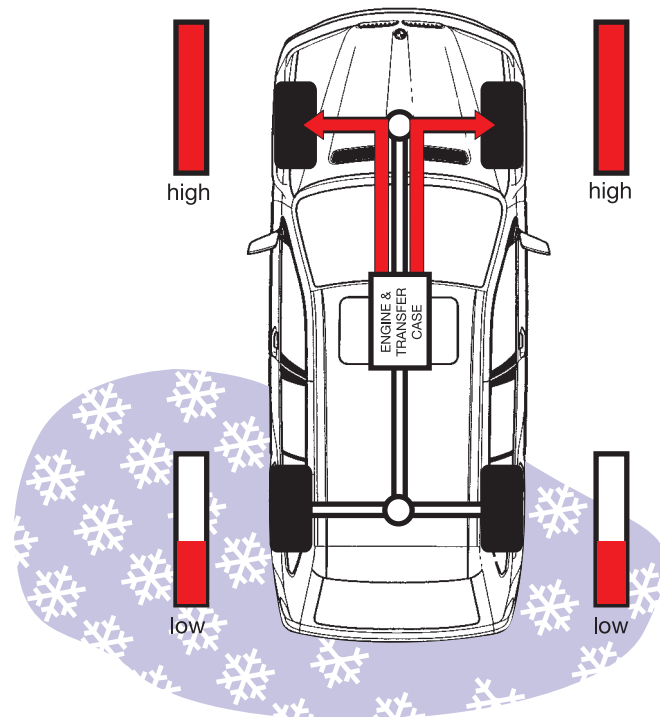
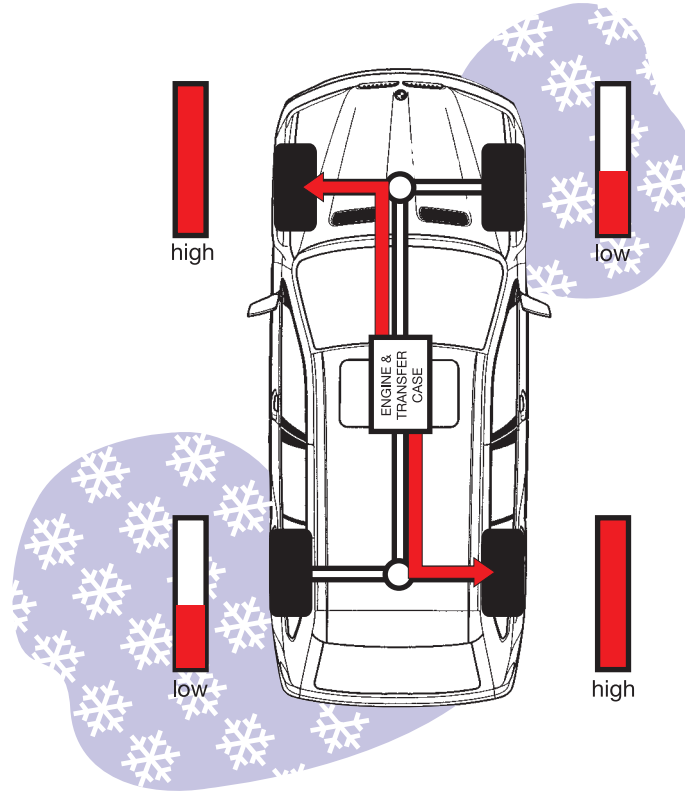
If one or more wheels spin or slip, the DSC will activate a regulation process and the brakes on the effected wheel(s) will be pulsed. The driving torque will be distributed through the differential to the remaining wheels with a good coefficient of friction

The driving torque will be applied through the differential as follows:

- Three wheels - with one wheel spinning.
- On two diagonal wheels with two wheels spinning on different axles.
- One axle only with two wheels spinning on the same axle.

Once the spin or slip is under control, the drive torque will again be applied to all wheels.





Traction Control

The traction control feature of the DSC III on the X5 cannot be switched OFF with the DSC switch. Pressing the button will only switch off the dynamic stability control function of the DSC.

The traction control feature is needed at all times to provide anti-spin control especially when driving the vehicle off road. The DSC warning lamp in the instrument cluster will still come on when the system is switched off manually or there is a fault in the system.

Off road traction control or HDC regulation places an additional load on the brakes. To prevent overheating of the brakes and rotors, the temperature of the rotors is calculated over time from the road speed and amount of brake application. If the temperature of one or more rotors goes above 600^o C, the traction control or HDC function for that wheel will be cancelled temporarily. Once the temperature of the rotor goes below 500^o C, the traction application will be re-activated.

The normal braking function (including ABS) is always active at any temperatures.

Off-Road ABS Control Module Programming

The programming for ABS regulation have changed to allow a higher threshold for ABS regulation when driving off-road in loose gravel or dirt. A locked wheel is more effective in slowing or stopping the vehicle because of the wedge that is built up in front of the tire.

The programming in the DSC control module allows one or both front wheel(s) to lock up to a speed of 12 MPH as long as the vehicle is traveling straight ahead. If the DSC control module receives a signal from the steering angle sensor indicating a turn, ABS regulation will activate to prevent the lock and allow the vehicle to be steered.

Diagnosis

The following diagnostic functions are available using the DISplus or GT-1.

Control Unit Functions:

Expert mode diagnosis available at any time during troubleshooting. To enter: press the Control Unit Functions button at the right lower corner of the screen.

The contents are:

- **Identification**
- **Delete Fault Memory**
- **Read Fault Memory**
- **Component Activation**
- **Status queries (requests)**

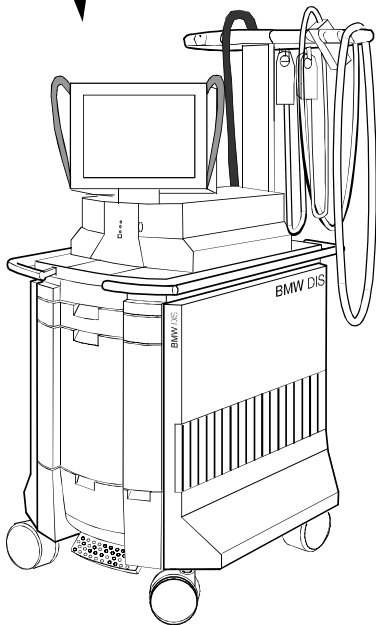
Service Functions:

Provides access to specialized test modules used as post repair procedures. To enter:

- Function Selection
- Service Functions
- Chassis
- Dynamic Stability Control

The contents are:

- **Connection Speed Sensor:** A test to verify the proper wiring to the wheel speed sensors
- **Connection Brake Lines:** A test to verify the proper brake pipe connections to the hydraulic unit.
- **Adjustment Functions:** Test modules to initialize certain components after repair work is performed
 - Steering Angle Sensor
 - Lateral Acceleration Sensor
 - Pressure Sensors



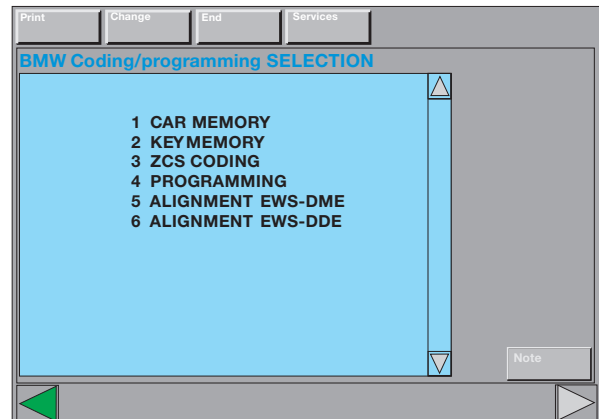
Test Modules: Faults with the MK60 system can be diagnosed using fault or symptom driven test modules. To begin diagnosis:

- **Perform the Quick Test.**
- **Select Vehicle Symptom from the Symptom Selection page.**
- **Select Test Module from Test Plan page.**
- **Press the Test Schedule Button.**

Test Modules are configured in the E46 diagnosis concept.

Coding

Coding must be performed after replacement of the DSC III control module or the steering angle sensor. ZCS coding is found in the Coding and Programming selection from the start screen or when pressing the Change button. Follow on-screen instructions for initialization of components after completing the coding process.



Adjustment Functions

Adjustment (initialization) of certain components is required when:

- Replacing the DSC III Control Unit.
- Replacing/Re-coding the Steering Angle Sensor.
- Replacing Rotation/Lateral Acceleration Sensor.

Steering Angle Sensor

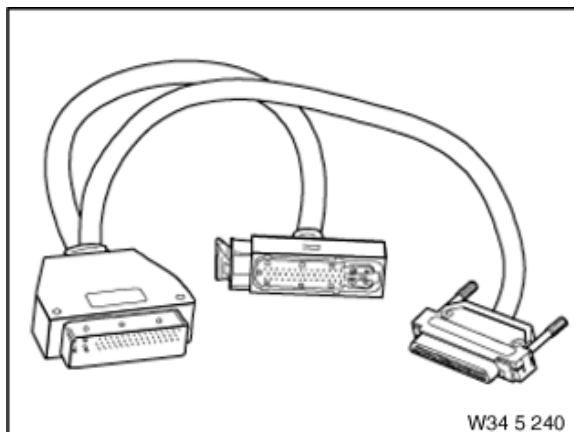
The steering angle sensor requires an offset adjustment after the sensor has been replaced, coded or after repairs to the steering or suspension system. The offset adjustment informs the steering angle sensor processor of the straight ahead position of the front wheels.

The adjustment is performed by completing the Test Module found in Service Functions. Once the adjustment is complete, the sensor sends an identification number over the CAN bus to the DSC control unit. The ID provides confirmation that the steering angle sensor is coded and has successfully completed the adjustment procedure.

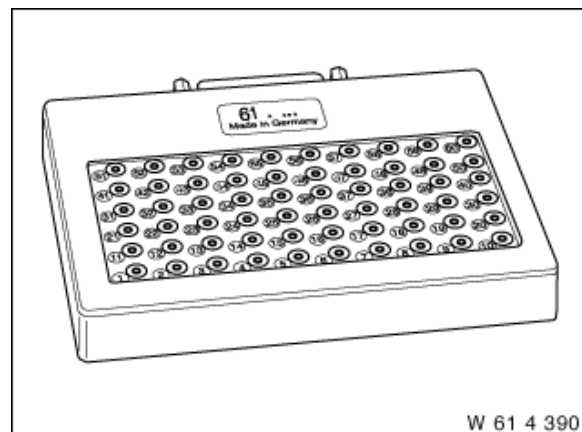
Special Tools

Special Tools available for the Bosch DSC III 5.7 consist of:

42 Pin V-Cable 34 5 240



60 Pin Break-Out-Box



review Questions

1. Describe the operation of the DSC button on the X5 DSC III system?

2. Describe the activation criteria for HDC:

3. What type of wheel speed sensors are used in the X5 DSC III system?

4. What is the difference in ABS control logic for the X5 DSC III in comparison to the 2wd models?

5. What service procedures are required when replacing a steering angle sensor?

6. Describe the operation of the "Automatic Differential Lock" function.

Review Questions

7. List the various sensors used to detect oversteer/understeer in the DSC III systems.

8. What is the purpose of the DBS sub-function?

9. What is the handbrake input signal used for?

10. What is the criteria for MBC activation?

11. Briefly explain Corner Braking Control (CBC):
